WATER LEVEL MEASU[illegible]LTRASONIC SENSOR

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STATEMENT OF AWARD FOR DEGREE

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We hereby declare that we have checked this thesis and in our opinion, this thesis is adequate in terms of scope and quality for the award of degree of Bachelor of Engineering Technology in Electrical.

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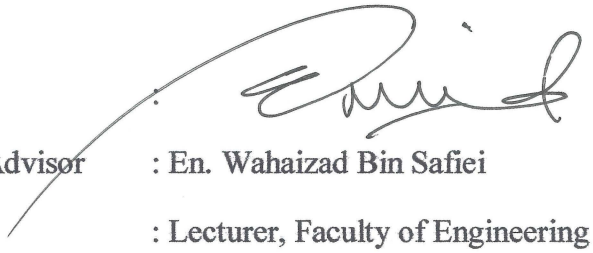
Signature : 

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I hereby declare that the work in this thesis is my own except for quotations and summaries in which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree.

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ABSTRACT

In recent years, natural disaster specifically flash flood have frequently caused major properties damage and life casualty, due to unconscious of rapid water level rising in the flood prone area. A water level monitoring system, is a crucial component that can prevent the unawareness during monsoon season, a real-time alerting system equipped with range sensor and audio visual mechanism possibly will be the solution for this problem. This project proposed an idea for the application for public interest to measure the escalation of water level by using ultrasonic sensor. The sensor is placed vertically to the lateral water surface connected to the ultrasonic sensor controlled by microcontroller to measure the distance of the water. Whenever the water reach certain level, the ultrasonic sensor will transmit the signal and the level is calculated using an appropriate formula.

TABLE OF CONTENTS

CHAPTER 4: METHODOLOGY & PROJECT MANAGEMENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

DC	Direct current
DSP	Digital Signal Processor
EPDM	Ethylene Propylene Dyne Monomer
HDPE	High-Density Poly Ethylene
LDPE	Low-Density Poly-Ethylene
LED	Light Emitting Diode
NBR	Buna N. Acrylonitrile Butadiene
NC	Normally Closed
NO	Normally Open
PET	Polyethylene Terephthalate
PLA	Poly Lactic Acid
PMMA	Poly (methyl methacrylate)
PP	Polypropylene
PS	Polystyrene
PTFE	Polytetrafluoroethylene
PVC	Polyvinyl Chloride
SMS	Short Message System
ToF	Time of Flight
US	Ultrasonic
USB	Universal Serial Bus
UV	Ultraviole

CHAPTER 1

PROJECT BACKGROUND

1.1 PROJECT BACKGROUND

Recently, drastic climate changes effected from thinning of ozone layer causing the melting of polar ice cap has raised the sea level that leads to weather abnormality. Abnormality such as mega hurricane that caused billions of dollars in property damage and thousands of life casualties has struck few nations of the world. Flash floods is one of the minor abnormality that also caused damage to the publics, but the impact is rather preventable. As the name given flash flood comes rapidly without any signs, if the flood struck during the time humans in the most vulnerable state the probability of casualty is considered highly plausible.

Hence, the objective of this project is to create a complete system that provide an alert for the locals living in the flood prone area. The system alert consist of three aspects alerting through visual alerts audible alerts and close proximity alert (i.e. smartphone through SMS).

With the changing of the technologies, the production plant especially in the food industries will have to begin developing critical methods to improve the idea of making the production process going really fast and efficient. Our country has also been involving greatly in the production of the liquid packaging whereby the liquid level controller is a must have item in the system. The liquid level controller is not just limited to food industries but they are also widely used in many other sectors where liquid level control is involved. The industrial applications include liquid-level sensing in transport tanks, storage tanks and water treatment tanks, and also in the petrochemical industries for sensing liquids such as petrol, diesel and other fuels. Besides that, liquid level measurement is also used in household applications including electronic devices such as, water dispensers, water evaporators, steamers, heating systems, washing machines, steam irons, juice squeezers and automated-coffee machines.

Table 1.1: *Application of the liquid level controller in various sectors*

Application	Material	Resistance (Ohms)
Agricultural	Ammonium Nitrate	18 K
Dairy Equipment	Milk	1 K
Material Handling	Cement Slurry	5 K
Food & Cooking Equipment	Corn Syrup Cake Batter	45 K 5 K
Pumping Equipment	Fresh Water Salt Water	5 K 2.2K
Vending Equipment	Coffee Fruit Juice	2.2 K 1 K
HVAC/R	Condensate Water	18 K

There has been a huge success where many liquid level controller devices are developed and each of them has different characteristics which allow them to be used in different kind of situation. Liquid level sensors are generally defined as the sensor used for detecting level of liquids or interfaces between liquids such as solids and liquids or water and oil. They are also known as a transducers or integrated systems with instrumentation control capabilities. This kind of sensor plays an important role in several of industries and also consumer applications. Some level controller sensor measurement systems are made to adhere with various parameters such as wide range of applications, high accuracy needs, and system installation requirements and practices.

The approach here is to apply the ultrasonic sensor to control and measure the level of the liquid. The liquid level controller is an ideal solution for liquid level problems in dangerous locations such as the sewage, waste water, chemical and ground water pump. Hence, the designation of an improved system of water level controller is necessary to achieve the target. The general operation of the liquid level controller using ultrasonic sensor starts where the controller sends electric or pneumatic signals to the local control system, main control system or to the automated control valve directly. They are used for controlling the level of liquids in the applications of industrial refrigeration like liquid separators, flood evaporators and intermediate receivers. The controller communicates with the transmitter which measures the level of liquid continuously in the reservoirs. They are ideal for both non-conductive liquids such as oil or diesel and conductive liquids such as water. This project is intended to invent a liquid level controller for appropriate needs that might be useful for industrial and consumer's needs.

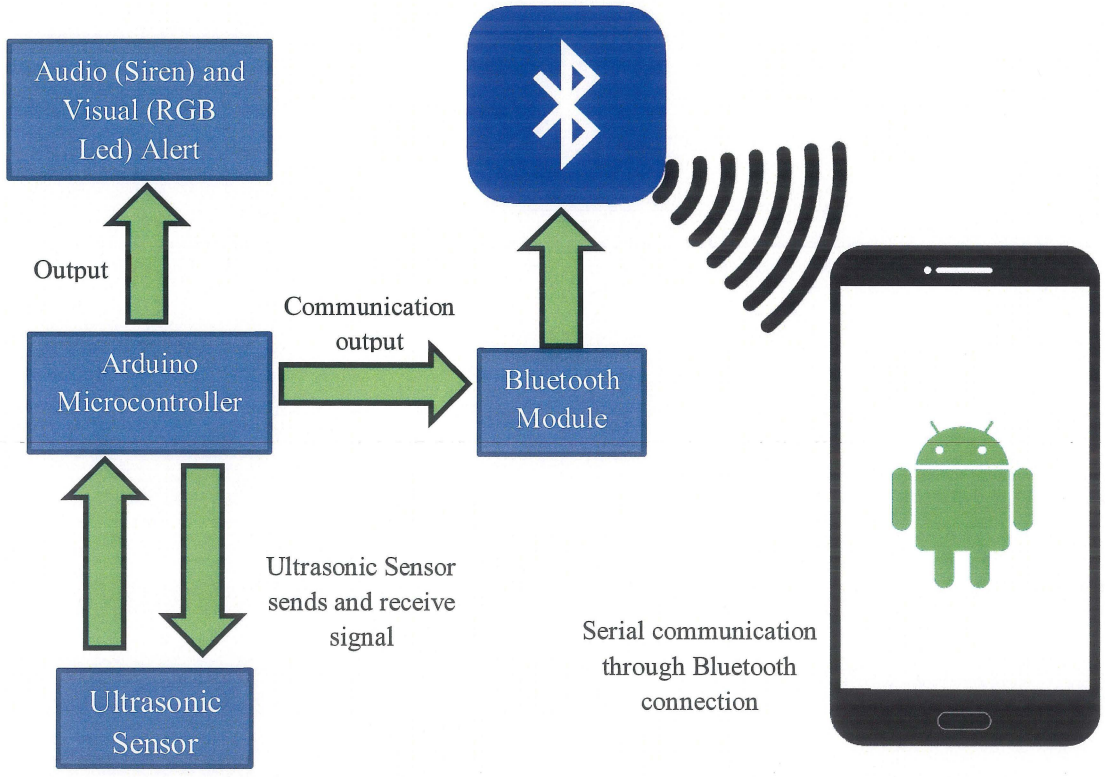

Figure 1.1: *A water level measuring system*

REFERENCES

A.M. Flynn, Combining sonar and infrared sensors for mobile robot navigation, International Journal of Robotics Research 6 (7) (1988) 5–14.

Ali, W. G. (2011). A semi-autonomous mobile robot for education and research.*Journal of King Saud University - Engineering Sciences, 23*(2), 131-138. doi:10.1016/j.jksues.2011.03.007

Andrady, A. L., & Neal, M. A. (2009). Applications and societal benefits of plastics, 1977–1984. http://doi.org/10.1098/rstb.2008.0304

B. Mustapha, A. Zayegh and R.K. Begg, "Multiple sensor-based Obstacle Detection System ," Proceedings of 4th International Conference on Intelligent and Advanced Systems, ISBN:978-1-4577-1966-0,Kuala Lumpur, 12-14 June 2012.

Benet, G., & Blanes, F. (2002). Using infrared sensors for distance measurement in mobile robots, 1006, 1–12.

Bill Fry. 1999. *Working with Acrylic*. Millicent Treloar. U.S of America; Society of Manufacturing Engineers

B. T. Phong., "Illumination for computer generated pictures,"Communications of the ACM, vol. 18(6), June 1975, pp. 311-317.

Chang, Y., Ham, J., & Bae, J. (2009). Reliability and life study of hydraulic solenoid valve . Part 2 : Experimental study. *Engineering Failure Analysis*, *16*(3), 944–963. http://doi.org/10.1016/j.engfailanal.2008.08.012

Chaudhary, D., & Liu, Æ. H. (2009). Influence of high temperature and high acidic conditions on geopolymeric composite material for steel pickling tanks, 4472–4481. http://doi.org/10.1007/s10853-009-3678-2

Czaja, Z. (2012). A microcontroller system for measurement of three independent components in impedance sensors using a single square pulse. Sensors and Actuators A: Physical, 173(1), 284-292. doi:10.1016/j.sna.2011.10.018

Fallis, A. . (2013). No Title No Title. Journal of Chemical Information and Modeling, 53(9), 1689–1699. http://doi.org/10.1017/CBO9781107415324.004

Fisher, D. K., & Kebede, H. (2010). A low-cost microcontroller-based system to monitor crop temperature and water status. Computers and Electronics in Agriculture, 74(1), 168-173. doi:10.1016/j.compag.2010.07.006

G. Benet, J. Albaladejo, A. Rodas, P.J. Gil, An intelligent ultrasonic sensor for ranging in an industrial distributed control system, in: Proceedings of the IFAC Symposium on Intelligent Components and Instruments for Control Applications, Malaga, Spain, May 1992, pp. 299–303.

Hi, B. K. (1938). PRESSURE LOSSES FOR FLUID FLOW IN 90 ° PIPE BENDS, *21*.

H.R. Everett, Sensors for Mobile Robots, AK Peters, Ltd., Wellesley,MA, 1995.

J.A.Brydson. 1999. *Plastic Materials*. Seventh Edition. Woburn; Butterworth-Heinemann

Kamemura, T., Takagi, H., & Pal, C. (2008). Development of a Long-Range Ultrasonic Sensor for Automotive Application. *SAE International*, *1*(1), 301–306. http://doi.org/10.4271/2008-01-0910

Kaur, M., & Pal, J. (2015). Distance Measurement of Object by Ultrasonic Sensor HC-SR04, *3*(05), 503–505.

Koley, E., Kumar, R., & Ghosh, S. (2016). Low cost microcontroller based fault detector, classifier, zone identifier and locator for transmission lines using wavelet transform and artificial neural network: A hardware co-simulation approach. International Journal of Electrical Power & Energy Systems, 81, 346-360. doi:10.1016/j.ijepes.2016.02.015

Mohammad, T. (2009). Using Ultrasonic and Infrared Sensors for Distance Measurement, *3*(3), 267–272.

Mustapha, B., Zayegh, A., & Begg, R. K. (2014). Ultrasonic and infrared sensors performance in a wireless obstacle detection system. *Proceedings - 1st International Conference on Artificial Intelligence, Modelling and Simulation, AIMS 2013*, 487–492. http://doi.org/10.1109/AIMS.2013.89

Park, C., Lim, B., & Chung, K. (2015). Design verification methodology for a solenoid valve for industrial applications †, *29*(2), 677–686. http://doi.org/10.1007/s12206-015-0127-9

U, L. H. (1998). Materials selection for optimal environmental impact in mechanical design.

Ultrasonic and Infrared Sensors Performance in a Wireless Obstacle Detection System by Baharuddin Mustapha, Aladin Zayegh, Rezaul K. Begg,College of Engineering & Science, Victoria University, Australia,Institute of Sport, Exercise and Active Living (ISEAL) and College of Sport and Exercise Science (SES), Victoria University, Australia.